

IN THE CLAIMS:

1. (previously presented) A near-field optical probe, comprising:

a cantilever formed of a transparent material and having a first main surface and a second main surface opposite the first main surface;

a base supporting the cantilever at the first main surface;

a tip extending from the second main surface of the cantilever and having a microscopic aperture at an end thereof, the tip being formed of a transparent material having a higher refractive index than that of the transparent material of the cantilever to increase an amount of near-field light generated or detected by the microscopic aperture; and

a shade film formed on the second main surface of the cantilever and on a surface of the tip except for the microscopic aperture.

2. - 4. (canceled)

5. (previously presented) A near-field optical probe according to claim 1; wherein the tip has a circular conical shape.

6. (previously presented) A near-field optical probe according to claim 1; wherein the tip has a plurality of surfaces having different taper angles.

7. (previously presented) A near-field optical probe according to claim 1; wherein the cantilever has a lens for focussing incident light to the microscopic aperture or for collimating light detected at the microscopic aperture.

8. (previously presented) A near-field optical probe according to claim 7; wherein the lens comprises a Fresnel lens formed on a side of the base.

9. (currently amended) A near-field optical probe according to claim 7; wherein the lens comprises a refractive-index gradient-index lens.

10. (previously presented) A near-field optical probe according to claim 1; wherein an end of the tip is positioned nearly in a same plane as an end surface of the shade film.

11. (previously presented) A near-field optical probe according to claim 1; wherein an end portion of the tip protrudes from an end face of the shade film in an amount equal to or smaller than a half of a wavelength of incident light focussed on the microscopic aperture and/or light detected at the microscopic aperture.

12. (previously presented) A near-field optical probe comprising:

a cantilever having a first main surface and a second main surface opposite the first main surface, the cantilever being disposed at an inclination angle  $\theta_1$  relative to a surface of a sample;

a base supporting the cantilever at the first main surface;

a tip having a height H and extending from the second main surface of the cantilever and having a microscopic aperture at an end thereof; and

a shade film formed on the second main surface of the cantilever and on a surface of the tip except for the microscopic aperture;

wherein when a radius of a light spot on the cantilever resulting from light incident on the tip or light detected by the microscopic aperture and being incident on a detector is R1, a distance L1 from a center of the tip to a free end of the cantilever satisfies the equation  $R1 < L1 < H/\tan \theta_1$ .

13. (previously presented) A near-field optical probe according to claim 12; wherein an end of the cantilever has a slant portion extending from the first main surface to the second main surface.

14. (previously presented) A near-field optical probe according to claim 12; wherein a side surface of the cantilever has a slant portion extending from the first main surface to the second main surface.

15. (previously presented) A near-field optical probe according to claim 12; wherein the cantilever has a first portion having the first and second main surfaces, a second portion extending along a plane disposed generally parallel to the first main surface of the first portion, and a connecting portion extending in a direction opposite to the direction of extension of the tip and connecting the first portion to the second portion.

16. (previously presented) A near-field optical probe according to claim 12; wherein the cantilever has a fixed end, a free end opposite to the free end, and a convex portion disposed closer to the free end than the fixed end.

17. (previously presented) A near-field optical probe comprising: a cantilever having a first main surface, a second main surface opposite the first main surface, a fixed end, a free end opposite to the free end, and a convex portion disposed on the second main surface, the cantilever being disposed at an inclination angle  $\theta_1$  relative to a surface of a sample; a base supporting the cantilever at the first main

surface; a tip having a height H and extending from the second main surface of the cantilever and having a microscopic aperture at an end thereof, the convex portion of the cantilever being disposed at a position closer to the fixed end of the cantilever than to the tip, and a height of the tip being greater than a height of the convex portion; and a shade film formed on the second main surface of the cantilever and on a surface of the tip except for the microscopic aperture; wherein when a radius of a light spot on the cantilever resulting from light incident on the tip or light detected by the microscopic aperture and being incident on a detector is R1, a distance L1 from a center of the tip to a free end of the cantilever satisfies the equation  $R1 < L1 < H/\tan \theta_1$ .

18. (previously presented) A near-field optical probe according to claim 16; wherein the convex portion is disposed on the first main surface of the tip.

19. (previously presented) A near-field optical apparatus comprising:

a near-field optical probe according to claim 1;  
an introducing/detecting optical system having a lens for introducing light to the microscopic aperture of the near-field optical probe or detecting light from the microscopic aperture of the near-field optical probe;

a detector for detecting a distance between the microscopic aperture of the near-field optical probe and a sample by an optical lever method, the detector having a mirror integral with the lens of the introducing/detecting optical system; and

a fine movement mechanism for finely moving the sample or the near-field optical probe.

20. (previously presented) A near-field optical apparatus comprising:

a near-field optical probe according to claim 1;  
an introducing/detecting optical system for introducing light to the microscopic aperture of the near-field optical probe or detecting light from the microscopic aperture of the near-field optical probe;

a detecting device for detecting a distance between the microscopic aperture of the near-field optical probe and a sample, the detecting device having a light source and an optical detector extending in a plane disposed generally perpendicular to the cantilever of the near-field optical probe; and

a fine movement mechanism for finely moving the sample or the near-field optical probe.

21. (previously presented) A near-field optical apparatus according to claim 20; wherein the optical detector detects light emitted from the light source and reflected by the cantilever.

22. (previously presented) A near-field optical apparatus according to claim 20; wherein the optical detector detects light emitted from the light source and diffracted by the cantilever.

23. (previously presented) A near-field optical apparatus comprising:

a near-field optical probe according to claim 1;  
an introducing/detecting optical system for introducing light to the microscopic aperture of the near-field optical probe or detecting light from the microscopic aperture of the near-field optical probe;

a detector for detecting a distance between the microscopic aperture of the near-field optical probe and a sample and for detecting an interference between the cantilever of the near-field optical probe and an optical fiber disposed close to the cantilever; and

a fine movement mechanism for finely moving the sample or the near-field optical probe.

24. (previously presented) A near-field optical apparatus comprising:

a near-field optical probe according to claim 1;  
an introducing/detecting optical system having a lens for introducing light to the microscopic aperture of the near-field optical probe or detecting light from the microscopic aperture of the near-field optical probe;

detecting means for detecting a displacement of the cantilever of the near-field optical probe and for detecting a distance between the microscopic aperture of the near-field optical probe and a sample; and

a fine movement mechanism for finely moving the sample or the near-field optical probe.

25. (previously presented) A near-field optical apparatus comprising:

a near-field optical probe according to claim 1;  
an introducing/detecting optical system having an optical fiber for introducing light to the microscopic aperture of the near-field optical probe or detecting light from the microscopic aperture of the near-field optical probe;

detecting means for detecting a distance between the microscopic aperture of the near-field optical probe and a sample; and

a fine movement mechanism for finely moving the sample or the near-field optical probe.

26. - 28. (canceled)

29. (previously presented) A method for manufacturing a near-field optical probe, comprising the steps of: forming a step portion on a substrate; providing a transparent member on a first main surface of the substrate; etching a part of the transparent member to form a tip in the vicinity of the step portion; forming a mask on the transparent member covering the tip and etching the transparent member using the mask to form a lever; etching the substrate from a second main surface opposite to the first main surface to form a base; and forming a shade film on the lever and on the tip except for an end portion of the tip.

30. (previously presented) A method for manufacturing a near-field optical probe, comprising the steps of: forming a step portion on a substrate; burying a weight material to be used as a weight portion in the step portion; providing a transparent member on a first main surface of the substrate; etching a part of the transparent member to form a tip; forming a mask on the transparent member covering the tip and etching the transparent member using the mask to form a lever; etching the substrate from a second main surface opposite to the first main surface to form a base; and forming a shade film on the lever and on the tip except for an end portion of the tip.

31. (previously presented) A method according to claim 30; wherein the burying step comprises providing the weight material on the substrate to at least fill the step portion with the weight material, and removing part of the weight material so that a surface of the weight material provided in the step portion and a surface of the substrate are disposed in a single plane.

32. (previously presented) A method for according to claim 31; wherein the step of removing the weight material comprises polishing the weight material.

33. (previously presented) A near-field optical probe according to claim 1; wherein the tip is generally conical-shaped.

34. (previously presented) A near-field optical probe according to claim 1; wherein the tip is generally pyramidal-shaped.

35. (previously presented) A near-field optical probe according to claim 6; wherein the tip is generally conical-shaped.

36. (previously presented) A near-field optical probe according to claim 6; wherein the tip is generally pyramidal-shaped.

37. (previously presented) A near-field optical probe according to claim 12; wherein the tip is generally conical-shaped.

38. (previously presented) A near-field optical probe according to claim 12; wherein the tip is generally pyramidal-shaped.

39. (previously presented) A near-field optical apparatus according to claim 19; wherein the tip of the near-field optical probe is generally conical-shaped.

40. (previously presented) A near-field optical apparatus according to claim 19; wherein the tip of the near-field optical probe is generally pyramidal-shaped.

41. (previously presented) A near-field optical apparatus according to claim 20; wherein the tip of the near-field optical probe is generally conical-shaped.

42. (previously presented) A near-field optical apparatus according to claim 20; wherein the tip of the near-field optical probe is generally pyramidal-shaped.

43. (previously presented) A near-field optical apparatus according to claim 23; wherein the tip of the near-field optical probe is generally conical-shaped.

44. (previously presented) A near-field optical apparatus according to claim 23; wherein the tip of the near-field optical probe is generally pyramidal-shaped.

45. (previously presented) A near-field optical apparatus according to claim 24; wherein the tip of the near-field optical probe is generally conical-shaped.

46. (previously presented) A near-field optical apparatus according to claim 24; wherein the tip of the near-field optical probe is generally pyramidal-shaped.

47. (previously presented) A near-field optical apparatus according to claim 25; wherein the tip of the near-field optical probe is generally conical-shaped.

48. (previously presented) A near-field optical apparatus according to claim 25; wherein the tip of the near-field optical probe is generally pyramidal-shaped.